A MONOGRAPH OF THE AUSTRALIAN SPONGES

By R. von Lendenfeld, Ph.D.

Part IV.

Plate I. to V.

PRELIMINARY REPORT ON THE AUSTRALIAN MYXOSPONGIÆ.

II. ORDO. MYXOSPONGIÆ. Haeckel (1).

SPONGES WITHOUT A SKELETON, OR WITH SPHERICAL POLYACTINELLID FLESHSPICULES.

Sollas (2) has remarked in a recent paper that the Myxospongiæ, as a group, containing Halisarca and Chandrosia, will eventually have to be abandoned, he thinks that the difference between the Halisarcinæ and Gumminæ is so great that we cannot combine them. The Halisarcidæ, with the genera *Halisarca* Dujardin and *Oscarella* Vosmær, are, according to Sallas, the sole true representatives of the Myxospongiæ, whilst the Gumminæ should, according to him, be placed in the neighbourhood of the Tetractinellidæ.

It is very difficult to say whether the Gumminæ represent transition forms from any ancestral groups to the Tetractinellidæ or not, but it is quite certain that there is a vast difference between the Gumminæ on the one hand and *Oscarella* and *Halisarca* on the other.

I think it will approach the real relationship nearest, to establish for these groups two Sub-orders within the Ordo Myxospongiæ, as follows :—

(1) *E Haeckel.* Die Kalkschwämme, eine Monografie. Band I., Seite 453.
(2) *W. T. Sollas.* On the development of Halisarca lobularis, O.S. Quarterly Journal of Microscopical Science, Vol. XXIV., p. 618.

I. SUB-ORDO. MYXINÆ. Von Lendenfeld.

MYXOSPONGIÆ, THE GROUND SUBSTANCE OF THE MESODERM OF WHICH IS A SOFT AND TRANSPARENT GALLERT AND DESTITUTE OF FIBRILLS OR SPICULES. RARELY SUPPORTED BY DISTANT FIBRES (HALISARCA). THE CILIATED CHAMBERS IN A SURFACE LAYER. THE INTERIOR LACUNOSE AND WITHOUT CHAMBERS.

This Sub-ordo is identical with the Halisarcinæ of O. Schmidt (1).

8. FAMILIA. OSCARELLIDÆ. Von Lendnfeld.

Myxinæ, with spherical ciliated chambers.

No Australian representatives of this family are known.

The sole representative, at the same time the type-species of the family is Halisarca lobularis, O. Schmidt (2), Oscarella lobularis, Vosmaer (3). It has been very exhaustively described by F. E. Schulze (4) and others. Halisarca Dujardini, Johnstone likewise exhaustively described by F. E. Schulze (5) belongs, I think, to another, the following family. The right place can of course not be assigned to those species which have not been investigated in a scientific manner.

9. FAMILIA. HALISARCIDÆ. Von Lendenfeld.

Myxinæ with sack-shaped, elongated ciliated chambers.

The type species of this Family is Halisarca Dujardini Johnstone, which has ramified ciliated tubes like certain Sylleibidæ. An Australian species which I have discovered belongs to this Family as possessing *elongate* ciliated chambers, the fibres found in Halisarca Dujardini are absent and the ciliated chambers are very regular in shape and never appear ramified. I establish therefore for this species the following new Genus.

(1) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Seite 79.
(2) *O. Schmidt.* L.c. Seite 80.
(3) *G. Vosmaer.* Porifera, Classen und Ordnungen des Thierreiches. Von Bronn. Band II., Tafel VIII.
(4) *F. E. Schulze.* Die Gattung Halisarca, Zeitschrift für Wissenschaftliche Zoologie. Band XXVIII., Seite 1.
(5) *F. E. Schulze.* L.c.

23. GENUS. BAJALUS. Von Lendenfeld (1).

Halisarcidæ with regular cylindrical not ramified, elongate ciliated chambers.

53. SPECIES BAJALUS LAXUS. Nov. spec.

This is the only Australian representative of the Suborder Myxinæ.

The specific name is derived from the loose texture and tenderness of the whole sponge, a consequence of its extensive lacunose cavities.

Our sponge represents (fig. 1-2) an irregular ramified or lobular mass of a dull purple colour. The separate processes are either finger-shaped and slender as in the specimen represented in fig. 1, or short broad and lobular as in the other. They measure to 18 mm. in length and from 2-10 mm., in breadth. The long and slender processes are cylindrical, the truncate ones generally more or less flattened. Both kinds of processes never occur on the same specimen, so that one might distinguish two varieties of this species, one with broad the other with slender ramifications. The whole sponge never seems to attain a large size, the finest specimen I have seen measured 50 x 40 x 20 mm. They seem always more or less expanded in one plain.

The Oscula are situated terminally on the processes so that there are as many vents to the sponge as there are branches to it. There are very small "chimneys" on them, slightly smaller than those tubes described by Schulze (2), which appear as prolongations of the Oscula margin in Oscarella lobularis.

The surface of the sponge appears perfectly smooth as in Halisarca Dujardini. The Oscula measure from 1-2 mm. across and are liable to great alterations in size. The "chimney" can be retracted, so as to leave the oscular opening nearly bare.

The inhalent pores measure 0·1 mm. across; they are circular. Each is covered by a thin and tender perforated plate. The perforations are circular or polygonal with rounded corners and

(1) *Bajulus.* A man who carries sacks, sackbearer.
(2) *F. E. Schulze.* L c. Plate I., fig. 6.

measure 0·01 in diameter (fig. 4). These little pores, as also the large inhalent vents below them, are liable to great alterations in size and can be contracted, the little ones even closed by the Sponge.

Canal System.

The Canal System is very peculiar and totally different from that of Oscarella. It approaches that of Halisarca but appears also much more complicated and highly developed than it is in that Sponge.

The outer skin (*b.* fig. 4) is divided from the interior part of the sponge, from the zone of ciliated chambers by a broad subdermal cavity, 0·15 mm., wide. This cavity is continuous. It is traversed in all directions by a highly complicated network of fine threads measuring 0·005—0·01 mm., in thickness (*s.* fig. 4). These repeatedly ramified anastomosing threads are cylindrical and between the joining points generally more or less straight. These threads connect the skin and the body of the Sponge. They appear to be contractile to a certain extent and by their contraction the subdermal cavity can be diminished in size locally.

The zone of ciliated chambers is much folded, and does not reach the subdermal cavity everywhere; there are moreover, empty spaces left between, which appear as inhalent canals (*i.*, fig. 3, *j.*, fig. 4). These are of an irregular shape, somewhat conic, as they are invariably wider centrifugally than proximally.

The ciliated chambers are of a regular elongate, oval, cylindrical shape. They are longer than in Aplysilla (1), and represent somewhat the radial tubes of the Syconidæ or the ciliated chambers of Euplectella (2). They measure 0·17 in length and are 1·03 mm. wide (*f.*, fig. 4). They have inhalent pores only at the distal end which touches a part of the inhalent canal system. These pores are ariable in number, probably because the Sponge can close them at option. Generally there seem to be from 3—5. As a look at fig. 4

(1) *R. v. Lendenfeld.* Neue Aplysinidæ, Zeitschrift für wissenschaftliche Zoologie. Band XXXVIII., Seite 234.

(2) *F. E. Schulze.* The soft parts of Euplectella aspergillum. Transactions of the Royal Society of Edinburgh. Vol. XXIX., p. 661. Tab. A.

will show, some chambers are in direct communication with the subdermal cavity, whilst others draw their supply of water from the inhalent canals. These ciliated chambers are not constricted at their exhalent aperture, which is circular and opens generally into a narrow exhalent canal (e. fig. 3), a few ciliated chambers open direct into the gastral cavity in the centre of the Sponge.

The exhalent canal system consists of more or less radial narrow canals, pointing slightly upwards towards the Osculum, these canals are cylindrical and curved in such a manner, that their distal portion runs for a short distance parallel to the outer surface, whilst their proximal part is radial, and often stands at nearly right angle with the former; and of an extensive gastral cavity taking up the central portion of the Sponge and traversed by a few thick and ramified threads of tissue.

The narrow exhalent branch canals have a diameter measuring from 0·1—0·3 mm. The central gastral cavity has a diameter equal to a fourth to a third of the diameter of the part of the Sponge in which it is situated. The threads pervading it in varying direction are distant and rare. They are more or less cylindrical, and measure 0·1 mm. in thickness.

Towards the Osculum they get scarcer and scarcer, in the uppermost 5 mm. of the Oscular tube or Gastral cavity there are none. (Fig. 3.)

Histology.

The *Skin* is covered on both sides by a low flat Epithelium and contains in the Gallert of its Mesoderm three kinds of cells. Amœboid wandering cells towards the lower surface in great abundance forming a regular layer (*d.* fig. 4); ordinary multipolar tissue cells and an external layer of Gland cells.

In the *threads* perforating the subdermal cavity, which are covered by the same Epithelium as the outer skin we find bipolar and multipolar tissue cells and also a few amœboid wandering cells The extensive inhalent canals are clothed with a similar Epithelium. The fringe cells in the chambers are of uniform kind throughout and do not become lower towards the inhalent aperture as in some

other Sponges. The Mesoderm between them is filled with bipolar and multipolar tissue cells and also contains a few wandering amœboids (fig. 4).

The thick threads pervading the gastral cavity are covered by a flat Epithelium, which is not different from the ectodermal Epithelium of the outer surface and inhalent canal system. The most prominent elements in this part of the Sponge are the sexual products, which at certain seasons take up nearly the entire substance of these gastral threads.

The amœboid wandering cells.

Partly by observations on the distribution of these elements and partly by a series of experiments, I have been led (1) to assume that they absorbed digestible matter, which is transmitted to them by the Epithel cells on the upper side of the Subdermal cavities in certain Aplysinidæ.

The distribution of these elements in our Sponge also points to a similar function. They are most numerous just below the inner surface of the skin, and met with, less abundantly, also in other parts of the Sponge.

I had no opportunity of observing these cells in the live tissue, but the images represented by good sublimate and Alcohol specimens on sections are exactly like those described by me (l.c.) in the case of Aplysinidæ.

The Gland Cells.

These elements have the same position as the corresponding elements in Aplysinidæ (2), and are also of similar shape. They appear pear-shaped and attached to the outer surface by two to four slender threads. They measure 0·01 x 0·002 mm.

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(1) *R. v. Lendenfeld.* Neue Aplysinidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXXVIII., Seite 249, ff.
(2) *R. v. Lendenfeld.* L.c. Seite 254.

The sexual products.

Ova and Spermatophores, that is to say, masses of Spermatozoons enclosed in a kind of sack are found abundantly and exclusively in the threads of the Gastral cavity. Poléjaeff (1) has given a new explanation of the formation of these masses of Spermatozoons, and I am inclined to believe that the Spermatogenesis described by that author from Sycandra also holds good in the case of our Bajalus.

Ova and Spermatozoa are never found in one and the same specimen, but that is no reason why this Sponge should not be hermaphroditic all the same, as it is not altogether improbable that the male and female products are matured in the same specimens at different times.

The fact that the sexual products are massed in the interior of the Sponge, in the exhalent canal system, shows that our Sponge is in this particuiar similar to Aplysilla (2), and particularly to Oscarella lobularis (3).

We find that in our Sponge there is, if my hypothesis (4) regarding the digestion of Sponges be accepted, a digestive cavity below the skin—the subdermal cavity—a breathing and excretary zone below this—the ciliated chambers—and a kind of very little differentiated sexual organ in the centre—the gastral threads—whilst the "Gastral cavity" has the function of a breeding place, a marsupium.

Locality: South Coast of Australia, Port Phillip, Von Lendenfeld. Pretty rare in the laminarian zone attached to stones.

Season: The Sponge was found repeatedly with sexual products in August and September. At that time and also at other times specimens without sexual products were obtained.

(1) *N. Poléjaeff.* Die Spermatogenese bei Sycandra raphanus. Sitzungsberichte der Kaiserlichen Academie der Wisenschaften in Wien, Mathematisch-Naturwissenschaftliche Classe. Band LXXXVI., Seite 278.
(2) *R. v. Lendenfeld.* L.c. Tafel XI., fig. 14.
(3) *F. E. Schulze.* Die Gattung Halisarca, Zeitschrift für wissenschaftliche Zoologie. Tafel IV., fig. 20.
(4) *R. v. Lendenfeld.* The Digestion of Sponges Ectodermal or Entodermal. Proceedings of the Linnean Society of New South Wales. Vol. IX., p. 434, ff.

II. SUBORDO. GUMMINÆ.

O. Schmidt (1).

MYXOSPONGIÆ WITH A MESODERM RENDERED TOUGH BY NUMEROUS DENSELY PACKED FIBRILLS WHICH FORM THE MAIN PORTION OF THE WHOLE SPONGE AND WHICH GIVE TO IT THE KNOWN INDIA-RUBBER LIKE DEGREE OF ELASTICITY AND HARDNESS. WITH OR WITHOUT SPHERICAL POLYACTINELLID FLESH-SPICULES.

This Subordo comprises at present only the single Family of the Chondrosidæ

When the aberrant *Cellulophana* O. Schmidt, will be better known it may perhaps require the establishment of a family for itself.

Corticium, O. Schmidt, which as we shall see connects the Gumminæ with the Tetractinellidæ might perhaps also be placed in a separate family of the Gumminæ.

10. FAMILIA. CHONDROSIDÆ. F. E. Schulze (2).

With the characters of the Subordo.

F. E. Schulze (3) has taken the trouble to enumerate all Sponges which have been described as members of this group.

There are seven genera enumerated by him :—Chondrosia, Nardo (4) ; Chondrilla, O. Schmidt (5) ; Osculina, O. Schmidt (6) ; Columnites, O. Schmidt (7) ; Corticium, O. Schmidt (8) ; Cellulophana, O. Schmidt (9), and Lacinia, Selenka (10).

(1) O. *Schmidt.* Die Spongien des Adriatischen Meeres. Seite 37.
(2) *F. E. Schulze.* L.c. Seite 87 ff.
(3) *F. E. Schulze.* Die Familie der Chondrosidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXIX., Seite 95.
(4) *Nardo.* Osservazione anatomiche supra l' animale marino detto volgarmente Rognone di mare Estratte dal, Vol. VI., degl' Atti dell' Istituto Veneto.
(5) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Seite 38.
(6) *O. Schmidt.* Die Spongien der Küste von Algier (Drittes Supplement zu den Spongien des Adriatischen Meeres.) Seite 42.
(7) *O. Schmidt.* Grundzüge einer Spongienfauna des Atlantischen Gebietes. Seite 25.
(8) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Seite 42.
(9) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Seite 41.
(10) *E. Selenka.* Ueber einige Schwämme aus der Südsee, Zeitschrift fü Wissenschaftliche Zoologie. Band XVII., Seite 568.

Chondrosia, Osculina, and Cellulophana contain no fleshspicules, and I combine them in my Sub-family Chondrosinæ.

Chondrilla contains spherical polyactinellid spicules, and I place it in my Sub-family Chodrissinæ.

Corticium, I consider, as a genus of Tetractinellidæ, connecting this order with the Myxospongiæ, in accordance with O. Schmidt (1).

Columnites is a Monactinellid Sponge, and Lacinia as Carter (2), and F. E. Schulze (3) have shown is no Sponge at all.

The Australian specimens I have found can be placed in the existing genera without any difficulty.

I. SUB-FAMILIA CHONDROSINÆ. Von Lendenfeld.

Chondrosidæ without fleshspicules.

24. GENUS. CHONDROSIA. Nardo.

Chondrosinæ with one or a few Oscula, a smooth surface and without incised frills to the Oscula.

54. SPECIES. CHONDROSIA RAMSAYI. Von Lendenfeld, fig. 6—9.

I dedicate this species to the Curator of the Australian Museum.

Chondrosia Ramsayi appears in flat, irregular masses, attached to rocks etc., by a few small places only. It always seems to have the shape of a convex lamella. The convex side is uppermost. Such a lamella may attain an extension of 40 x 30 mm., and at the same time be about 10—14 mm. thick. Smaller specimens are proportionately thinner.

The color is, extraordinary to say, subjected to no variability, it is always dark blueish black all over the Sponge in reflected light. In transmitted light it is dark brown.

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(1) *O. Schmidt.* Grundzüge einer Spongienfauna des Atlantischen Gebietes. Seite 64.

(2) *T. Carter.* On two new species of Gumminæ. Annales and Magazine of Natural History. Ser. IV., Vol. VII., p. 26.

(3) *F. E. Schulze.* Die Familie der Chondrosidæ. Zeitschrift für Wissenschaftliche Zoologie. Band XXIX., Seite 92.

The surface is shining as in other species, but *not quite smooth.* A reticulate structure as described by O. Schmidt (1) of Chondrosia plebeja does not exactly make its appearance, but still the roughness is of a kind not met with in other species of Chondrosia, so that by this alone our species is distinguished from others.

A transverse section shows, that the cortex is highly developed, and has a dark outer margin, it is very light coloured towards the interior. The Pulpa is of a uniform dark brown color. A few canals are seen in it (fig. 6), but these are rare and small, so that the Sponge is pretty dense, as is the rule with the genus.

The Osculae are more numerous than in other species, and grouped together as in Osculina (2). They possess small "chimneys" that is thin membraneous frills about 1 mm. high, which however are simple cylindrical, and have a smooth margin (different from Osculina.)

The Canal System.

The Canal System certainly shows some peculiarities which distinguish it from the hitherto investigated species, and if I have not established a new genus for our Sponge I have not done so mainly for the sake of simplicity and also because the canal system of our species although peculiar can be easily derived from that, so excellently described, of Chondrosina reniformis by F. E. Schulze (3).

Scattered all over the surface we find small pores, measuring about 0·01 across. These are circular and we soon perceive that they are always situated in groups of 5—10 and in fact, that there always lies a group of such pores at the base of an indenture. These indentures of the surface are inconspicuous. Their existence causes the roughness of the surface described above (fig. 8). I think it highly probable, that the pores of Chondrosia plebeja may be distributed in a similar manner.

(1) *O. Schmidt.* Die Spongien der Küste von Algier. Seite 1.
(2) *O. Schmidt* L.c. Seite 2.
(3) *F. E. Schulze.* Die Familie der Chondrosidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXIX. Seite 100 ff.

Below each group of pores we find an extensive hollow (on the section). In comparing the different sections of a continuous series it is easy to ascertain that these hollows are the expression of transverse sections of tangentally extended wide lacunose canals (fig. 7-8). Below the zone of these smaller tangental lacunes we find a system of larger ones similar in shape and distribution. The canals of the outer zone communicate with one another by means of very rare and minute pores (fig. 8), and also with the larger lacunes below by means of similar pores which in consequence of their paucity and smallness are very hard to find (figs. 7-8).

All these lacunes lie so close to one another, that only narrow walls of tissue remain between them (fig. 7.)

The average diameter of the lacunes in the outer zone is 0·05, of those in the lower zone 0·2mm. The lucunose zone has a thickness of 0·4 mm.

Below this no lacunes are found in the cortex, except a few very distant and large irregular tangental canals (fig. 6), which collect the water from the small communicating outer lacunes. These canals have very irregular transverse sections and an average diameter of 1 mm. The cortex is of about equal thickness, so that the whole thickness of it is taken up by these large inhalent canals. The lower side of these large tangental canals lies in the surface, which divides the cortex from the Pulpa of the Sponge.

From this lower side numerous canals originate, which are cylindrical, and follow a more or less radial direction. Repeatedly ramified, they become smaller and smaller the further we penetrate into the Sponge.

Around the final coecal and narrow ramifications the ciliated chambers, which are spherical, cluster. They have a diameter of 0·05 mm., and do not appear to be very numerous. The inhalent pores could not be found. The exhalent opening is small and circular. Regarding their shape and position they do not differ from those of Chondrosia reniformis, and I refer to F. E. Schulze's (1) description.

(1) *F. E. Schulze.* Die Familie der Chondrosidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXIX. Seite 107-108.

The exhalent canal system is simple not lacunose, and shows no peculiarities.

Structure.

Histologically our species resembles Chandrosia reniformis (1) very closely. The round fat like globular masses are most numerous towards the outer surface. Here also the Pigment masses (fig. 8) are situated. The latter follow the inhalent canals downward for a good distance (fig. 8). I found the whole surface covered with flat Epithelial cells. I failed to detect Gland cells, and believe that their protective function is performed in the Gumminæ by the universally distributed fat-like spherules so common below the outer surface. The walls of the large Canals inhalent and exhalent are highly granular, and the margin of this granular coating is sharply defined outward towards the Gallert tissue of the Sponge. This granular lamella is thicker around the large canals than around the small ones. Ciliated chambers are never found in the granular canal coating.

The pigment is massed in the outer portion of the Cortex, which consequently appears very dark in colour. The rest of the Cortex is nearly colourless, hyaline, and of much lighter colour than the pulpa (compare also F. E. Schulze's figures (2), the latter is very granular and intransparent.

Locality: East Coast of Australia, Port Jackson, 10-20 metres on stones, &c. (Ramsay.)

II. SUB-FAMILIA. CHONDRISSINÆ. Von Lendenfeld.

Chandrosidæ, with fleshspicules. The fleshspicules of this sub-family are of a very simple kind, and all represent the type of a ball with numerous irregularly disposed axes. The axes are represented by spines, extending radially from the sphere. The possible variations are the following: The spines may attain a relative great length whilst the diameter of the central solid sphere decreases;

(1) *F. E. Schulze.* Die Familie der Chondrosidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXIX. Seite 100 ff.
(2) *F. E. Schulze.* L.c. Tafel VIII., fig. 8.

in this way the star-shaped spicule is produced. The spines of this may be smooth or roughened, and serrated by secundary very small spines extending centrifugally.

If the central solid sphere attains a large size and the spines become small then the shape of a spiny ball is attained, which may be more like a Datura fruit or a Swiss "Morgenstern," according to whether the spines are numerous and slender or not numerous, short and thick.

25. GENUS. CHONDRILLA. O. Schmidt (1).

Chondrissinæ without subdermal cavities. The commencement of the inhalent canal system consists of a great number of parallel radial canals leading from the inhalent pores direct into tangental canals which collect the water and from which the inhalent system of the Pulpa originates.

Although this Genus is at present the only one of the Sub-family, still I give this diagnosis for the purpose of showing on what principles I consider other genera might be established.

55. SPECIES. CHONDRILLA SECUNDA. Nov. spec. Fig. 10-12.

I name this Sponge the second to commemorate the fact that it was of the thousands of different forms collected by me in Australia the second specimen I found.

Our Sponge resembles in outer appearance a lamellar or irregular bulbous mass, the lamellar shape is by far the most frequent. The Lamellæ are not of uniform thickness throughout; they attain an average size of 30 x 60 mm. and more, and are in the thickest part 12 mm., in diameter. In places these lamellæ are very thin and in fact they may be pierced in certain places so as to present a sieve-like appearance. The bulbous variety of this species is not large; it attains a diameter of 25-35 mm. It is attached to stones etc., by a small basis only. Also the more frequent lamellar form is attached to stones by small parts of its lower surface only. I obtained most of my specimens adrift The

(1) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Seite 38.

surface is perfectly smooth. The colour is subject to similar variations as in some European species and varies from light dull yellowish gray to dark bluish black.

Mostly the side exposed to the light seems to be of a darker colour than the other. However a strict rule can be established here as little as in the case of Chondrosia reniformis (1).

The outer surface-colour only is subject to the above variations. The interior of the Sponge always has the same dull grey colour. A Cortex is not distinguishable.

The oscula are raised slightly over the surrounding surface 3—6 in number, always on the upper side of the flat specimens, circular and about 2—3 mm. in diameter.

The bulbous specimens have only one osculum.

The outer part of the Sponge appears very dark and intransparent, in consequence of the great number of pigment granules in the dark parts. The light parts are much better suited for investigation and more transparent. This outermost zone always appears radially striped in consequence of the inhalent canals all standing vertical on the surface in their outer portion.

Structure.

Our species does not seem to differ from Chondrilla nucula (2) in any respect, except the shape of the spicules. There are two kinds of spicules. (Figs. 11, 12.)

Both kinds are met with not very abundantly throughout the Sponge. Towards the outer surface, and particularly also in the canal walls, they became much more numerous.

The larger kind measure 0·064 mm., the smaller kind 0·012 mm. across. The spines of the larger kind are about 0·006 mm. long at 0·004 mm. broad. The spines of the smaller kind measure 0·003 x 0·001 mm.

The larger kind represents a ball with distant short and truncate smooth spines which are rounded terminally. The surface of the central sphere is clearly visible between the spines. In the small kind the spines are pointed and relatively much longer, three

(1) *F. E. Schulze.* Die Spongien des Adriatischen Meeres. Seite 97-98.
(2) *F. E. Schulze.* Die Familie der Chondrosidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXIX., Seite 108 ff.

times as long as broad at the base, regularly conic. The surface of the central sphere does not exist, the spines stand so close that their bases touch each other.

Locality : South Coast of Australia, Port Phillip. (Von Lendenfeld.) Laminarian Zone.

56. SPECIES. CHONDRILLA AUSTRALIENSIS. Carter (1).

Incrusting or self-supporting, and spreading horizontally, flat, cakeshaped, lobed, of a dirty yellow or buff colour. Surface smooth, slippery, glistening consistence, semi-elastic, subcartilaginous. Tolerably tough. Vents numerous, small, of different sizes in groups or terminal on the lobes. Cortex translucent.

Spicules of two kinds. 1. With short, sharp conic spines, taking up the whole surface of the sphere. 2. With slender, sometimes terminally bifid or trified spines, with serrate side These two kinds of spicules are most numerous towards the outer surface. The short spined spicules measure 0·026 mm., the others 0·026 mm. across.

Locality : East Coast of Australia, Port Jackson.

NOTE.—I have dredged in Port Jackson numerous specimens of this Sponge. It appears to be very abundant.

57. SPECIES CHONDRILLA PAPILLATA. Nov. spec. Fig. 13—16.

This species is characterized by the very peculiar roughness of the surface. The Sponge is lobate and massive, not lamellar or globular as the other species generally. It appears somewhat like a hornsponge (fig. 13), in consequence of its erect shape and the papillæ on its surface.

It consists of a central mass from which cylindrical or slightly flattened processes extend upwards. The whole Sponge attains the great diameter of 60 mm. (height.) The processes measure 10—14 mm. in diameter.

The Oscula are situated terminally on these finger-shaped processes. They are circular and have a diameter of about 2 mm. There exist no "chimneys" around them.

(1) *H. Carter.* On two new species of Gumminæ. Annals and Magazine of Natural History, IV. Series. Vol. XII., p. 23, pl. I., fig. 10—14, 16.

The whole surface is greatly roughened in consequence of papillæ, which stand very close projecting from it all over the Sponge. (Fig. 13, 14.)

These papillæ are spherical, 1 mm. in diameter, and attached to the Sponge surface with a broad base, which is slightly smaller than the equatorial diameter. They appear as $\frac{2}{3}$ of spheres and stand so close to one another, that the spaces between them are always smaller than their own diameter. In some parts of the surface they even touch.

In internal structure this Sponge shows an aberrant peculiarity.

The spicules are of two kinds as in the foregoing and the following species. There are spherical spicules with short, sharp conic spines; and stellate spicules with slender, conic, serrated spines fig (15-16).

The *spherical spicule* measures 0·019 mm., across, the spines 000·3 x 0·002 mm. The *stellate spicule* 0·013 mm., across, the spines 0·008 x 0·0015 mm.

Both kinds of spicules are met with, scattered throughout the whole of the Sponge rather scarce. In the papillæ however the spicules are massed (fig. 14) so that the distance between the spicules is about equal to their diameter. The spicules lie here three or four layers deep. In this part of the Sponge the spherical spicules predominate very much over the stellate ones. In the Pulpa the difference in number of the two is slight. If there is any perceptible difference the stellate form predominates.

The colour of this species in spirits is a uniform light mélange or brown. The interior has the same colour as the surface, only in a lighter shade.

Locality: East Coast of Australia, Port Jackson, Ramsay.

58. SPECIES. CHONDRILLA CORTICATA. Nov. spec. Fig. 17-20.

This species is characterized by its extremely hard outer surface.

It has as yet only been found in the shape of rather thin lamellæ, which are peculiarly bent and curved so as generally to attain the shape of a cup (fig. 17).

The flat extended Sponge measures, full grown, 70 mm., in length, and 40 mm., in width. It is the largest of the Australian Gumminæ I have seen. The plate is of uniform thickness throughout measuring from 10-12 mm.

The outer surface is smooth. The whole Sponge has a light brown colour. The oscula are few in number, about seven to a large specimen, circular and slightly drawn in, that is to say at the bottom of slight funnel-shaped depressions in the surface, and surrounded by a ring-shaped slight elevation. Sometimes they lie in the plane of the surface.

The interior of the Sponge is coloured a little darker than the Cortex. A transverse section shows that the canals in the pulpa are more numerous and smaller than in other species.

The structure of the inner parts afford no peculiarity. The Cortex, however, is of great interest.

There are two kinds of spicules in this species as in the foregoing one. Spherical and stellate ones.

The *spherical spicule* measures 0·015 mm. across ; the spines are particularly short, broad, conic and truncate, with very sharp points they measure 0·001 mm. in height and are at the base 0·0015 mm. thick.

The *stellate spicule* measures 0·01 across ; the spines are mostly smooth and generally taper to one fine and sharp point, they are slender and conic, measuring 0·004 mm. in length and at the base 0·0008 mm. in width.

In the pulpa we find both kinds of spicules distributed pretty evenly with a slight preponderance of the stellate spicules. The spicules are scarce and on thin sections very far apart.

In the outer part of the Cortex, just below the outer surface we meet with a regular hard pavement of the spherical spicules which lie closely packed in three or four layers above one another. They lie as close to one another as their spherical shape will allow, and their spines are interposed with one another in such a manner

that the whole pavement attains a high degree of firmness. Similar cortical layers are known of many Sponges. No species of Gumminæ possesses them so highly developed as this Chondrilla corticata.

Locality : East Coast of Australia. Port Jackson.

EXPLANATION OF PLATES. I. TO V.

Fig. 1.—Bajalus laxus. R. v. L. A specimen of the variety with lobate processes. Natural size drawn from life.

Fig. 2.—Bajalus laxus. R. v. L. A specimen of the variety with finger-shaped slender processes. Natural size drawn from life.

Fig. 3.—Bajalus laxus. R. v. L. Transverse section through a process of the variety with slender outgrowths, 1:20. An outer trabecular reticulate zone, *(d)* can be distinguished and large conic inhalent Canals *(i.)* The exhalent Canals *(e)* are much narrower, extending more or less radially, these are cut obliquely, and therefore appear very oval in the section. The interior *(l)* appears lacunose, and can be considered as a wide Canal (like the central tribe of the Syconidæ) traversed by threads of tissue *(t.)*

Fig. 4.—Bajalus laxus. R. v. L. Distal part of the transverse section through a slender process 1:450. The inhalent pores (*p*) are covered by a thin perforated plate externally, (*a*) which is perforated by numerous small pores (*p*), leading into the pore (*P.*) Below the outer skin (*b*) a wide sub-dermal cavity extends all round the Sponge (*f*), which is traversed by numerous anastomosing and repeatedly ramified threads (*c*). All these parts are covered by flat Ectodermal Epithelium cells (*e*). In the skin and in the Sub-dermal threads we find amœboid wondering cells *(d.)* In the skin below the outer surface glandcells *(g)*, the water flows partly direct from the Sub-dermal cavity, and partly by way of large

conical inhalent canals *(I)* into the ciliated chambers *(f)*, which possess apparently from 3–5 inhalent pores at their distal rounded ends, exclusively *(h.)* Amœboid wondering cells *(d)* are also found in the Mesoderm between the ciliated chambers.

Fig. 5.—Bajalus laxus. R. v. L. A portion of the thread network in the central Gastral cavity of the Sponge. The thread is filled with Spermospores containing numerous Spermatozoans each, 1,000:1.

Fig. 6.—Chondrosia Ramsayi. R. v. L. Half a middle sized, flat specimen, in natural size drawn from a spirit specimen from the Australian Museum. The Oscula are slightly raised above the rest of the surface, but not surrounded by an incurved fringe as in Osculina.

Fig. 7.—Chondrosia Ramsayi. R. v. L. Transverse section, vertical to the upper surface 1:20. A cortex is well defined, *(c)* outwards it is dark colored *(b)*, and full of pigment granules, below it is light and transparent. The Pulpa *(p)* is colored much darker and very intransparent. Below the surface there is a layer of small anastomising irregular tangental canals, which form a kind of subdermal cavity *(i)*. They unite to form large likewise tangental inhalent canals *(t)*. From these small inhalent canals of a more or less radial direction originate the ramifications of these bear the ciliated chambers. The inhalent canals *(e)* unite to form large lacunose canals leading into the Oscular tubes.

Fig. 8.—Chondrosia Ramsayi. R. v. L. Transverse section through the Cortex showing the structure of the subdermal cavities and the distribution of pigment 1:200.

Fig. 9.—Chondrosia Ramsayi. R. v. L. Section through part of the Pulpa 1:80. Inhalent branch canals (*i*). Ciliated spherical chambers (*c*). Exhalent canals (*e*).

Fig. 10.—Chondrilla secunda. R. v. L. Drawn from life in natural size.

Fig. 11.—Chondrilla secunda. R. v. L. A large spherical spicule 300:1.

Fig. 12.—Chondrilla secunda. R. v. L. A small spherical spicule 300:1.

Fig. 13.—Chondrilla papillata. R. v. L. Natural size, drawn from a spirit specimen.

Fig. 14.—Chondrilla papillata. R. v. L. Transverse section through outer zone, showing a Papilla densly filled with spicules 70:1

Fig. 15.—Chondrilla papillata. R. v. L. Spherical spicule. 300:1

Fig. 16.—Chondrilla papillata. R. v. L. Stellate spicule. 300:1.

Fig. 17.—Chondrilla corticata. R. v. L. Natural size, drawn from life.

Fig. 18.—Chondrilla corticata. R. v. L. Transverse section through the outer zone 60:1, showing the dermal pavement skeleton.

Fig. 19.—Chondrilla corticata. R. v. L. A spherical spicule. 300:1.

Fig. 20.—Chondrilla corticata. R. v. L. A stellate spicule. 300:1.